ATLAS WHITE PORTLAND CEMENT
Pure white *and with all the strength of gray Portland cement*

FOR

ORNAMENTAL CAST WORK

The Atlas Portland Cement Company
25 B*roadway* ~ N*ew York*, N. Y.
Chicago ~ Birmingham ~ Kansas City
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The Making of Ornamental Work in Atlas White Portland Cement Concrete

WHITE Portland cement is largely responsible for the large and growing use of concrete for ornamental work of all kinds. It makes possible attractive looking concrete and this has led to the use of much material of this nature, replacing natural stone.

White Portland cement concrete has also greatly lowered the cost of this type of work and has put it within the reach of a far greater number of people. It is employed for all classes of work from the entire exteriors of the largest and most important buildings to the trim stone for the small dwelling. Garden furniture, lighting standards and ornamentation of all kinds are being produced in white cement concrete.

As with all other concrete work, the first necessity is to have a mold to hold the concrete until it hardens. Sometimes it is possible, particularly on large work, to make the mold directly in the same general way that forms are made for concrete buildings. In other cases, where the work has finer detail it is usually necessary first to make a complete model of the work which is to be reproduced and from this model make the mold.

Various types of materials are used for the models and the molds. For the models—wood, plaster and clay; for the molds—wood, sand, plaster and glue. The choice of material to use is one largely of experience and in this book will be indicated the material customarily employed. In the pages which follow, the methods of making various models and molds in the different types of materials are described and also the way of casting and finishing the concrete.

It is realized that in this book it is impossible to cover all the various phases of modeling and the making of molds, and if more information is wanted we can give you the names of the text books which go into the making of various types of models and molds in greater detail.

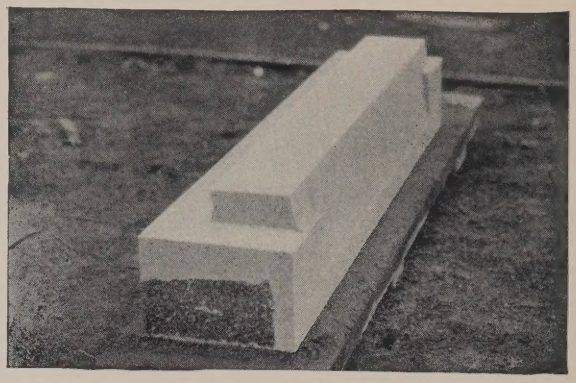
Wood Molds

Wood molds are used for the larger and more simple types of work, such as benches, lighting standards and sign posts where the necessary detail can be simply made in the wood. These molds may be for either dry tamped or wet poured work and vary slightly accordingly.

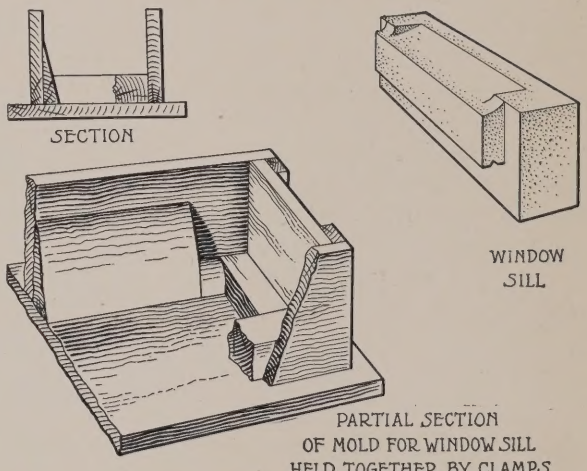
The wood should be dry and thoroughly seasoned. Soft wood such as white pine is the best. The wood must be perfectly waterproofed to prevent it from absorbing water from the concrete and consequently warping or swelling.

Waterproofing may be done by painting, varnishing, waxing or greasing; depending upon the nature of the work.

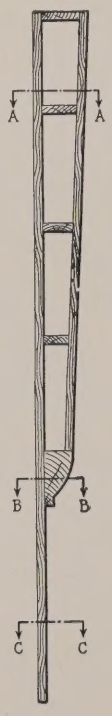
The forms should be carefully designed so that they can be removed from the cast without damage and readily reassembled. Sometimes there are undercut places in the work and this will require small detachable pieces fastened lightly to the main mold, which can be removed separately.

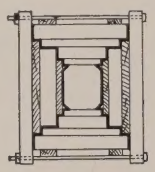


Faced Stone Trim.



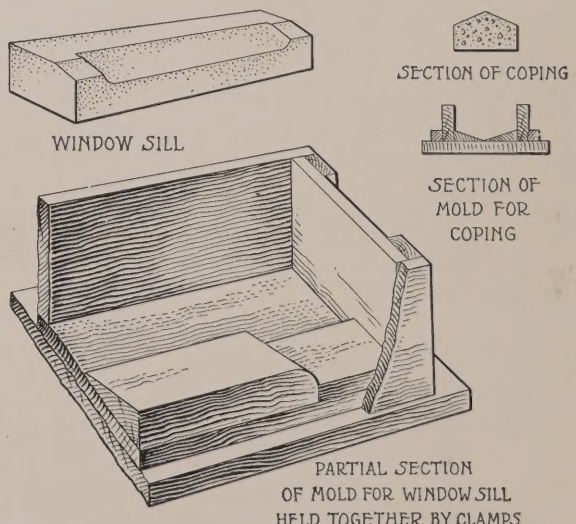
Mold for making stone trim shown above.





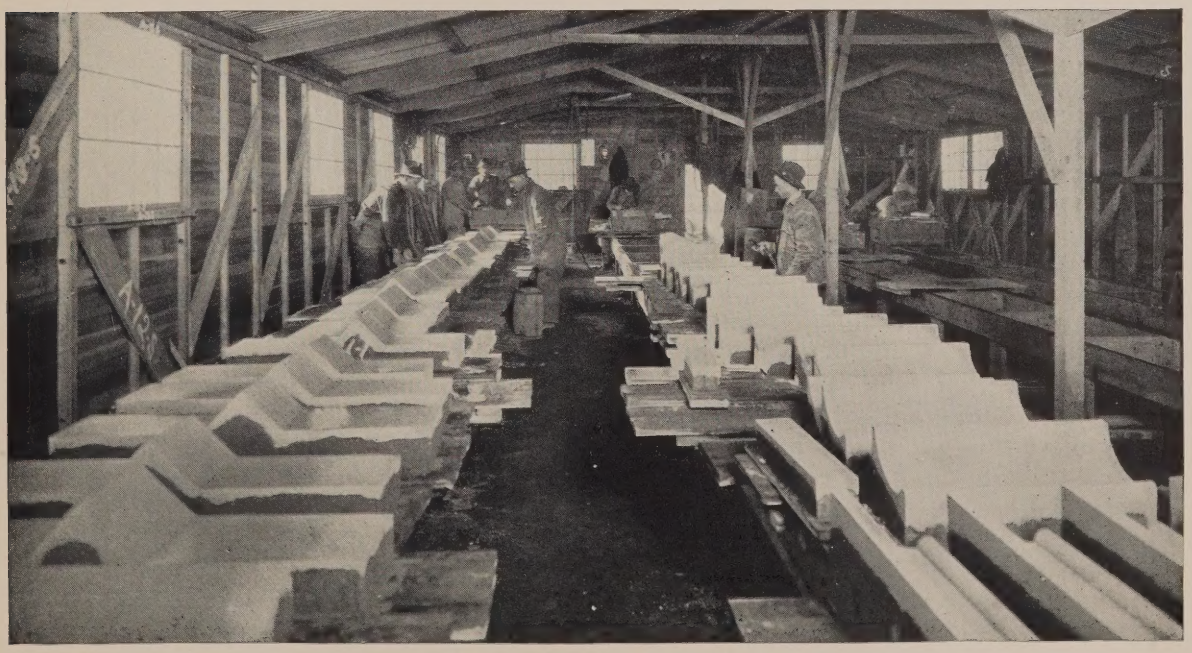
(Heavy Line Shows how Mold strips)

Light Standard and Mold.



Molds for Sills and Copings.

Making stone trim by the dry tamped process. The pieces are made face down and then turned over onto a pallet and the forms removed.



Ornamental Cast Work in Atlas White Portland Cement.

PLASTER MODELS AND MOLDS

In order to make an object of concrete it is first necessary to make a complete full sized model of the object that is to be reproduced, so that the mold can be made from it. If the object is, for example, a bird bath, the first requirement is to make a complete bird bath out of the easiest material—clay, plaster of Paris or wood. This is known as the model. Then this model is covered with a thick layer of plaster which, when removed, forms the reverse of the bird bath. When this mold is filled with concrete, the concrete of course takes the shape of the bird bath.

Models are made of several materials as mentioned above or in combinations of these materials. They can be made of anything that will hold its shape until the mold is made.

For simple work, wood is sometimes used but plaster of Paris is the customary material as it is cheap and easily worked. Where there is carving detail, clay is used. Plaster and clay are used together. A simple window box with an ornamental design would have the box part done in plaster and the design in the easily worked clay.

Assume that the piece wanted is a coping or belt course stone. As this is of symmetrical form it can best be made in plaster although wood could also be used.

The first step in making the model in plaster is to cut a template of thin sheet metal which is the reverse of the outline to be given the model. The template is fastened to a wooden framework that runs along the edge of the work table. A mixture of plaster and fibre is roughly molded to shape and then finished with plaster by moving the template back and forth. Figure 1 shows the template, Figure 2 shows the model being built up and Figure 3 shows the completed section. After it has hardened it can be sawed and mitred like lumber to make any shape required.

If the piece is very large it is often made hollow to save weight and material. This is done by building a core of clay thus giving the model the form of a shell.

For long symmetrical pieces such as posts and balustrades, the mold is turned in much the same manner as a piece of wood in a lathe. A sheet metal template is made and fastened to a frame. In front of the template revolves a shaft, usually made of pipe, to which is attached a handle of pipe. A thin layer of clay is first put on the pipe and then plaster is applied until the correct shape is given by revolving against the template. This is shown in Figures 5 and 6. Figure 7 shows one model still on the pipe and also one taken off the pipe and with the square top and base attached.

As different pieces of plaster are easily fastened together with more plaster, it is a simple matter to construct rather complicated models by making the separate pieces and joining them. The balustrade in Fig. 7, illustrates this partially. The circular portion is turned with a template and the square ends are made separately and then fastened to the other portion.

Figure 4 shows the making of a model for a sphere. The template for this is cut in the form of a semicircle.

In all modeling work of this type the plaster is added in small amounts and the model slowly built up. The plaster should be about the consistency of thick cream. Fill a pan about half full of water and sprinkle the plaster into the water. (Never pour the water into the dry plaster.) Put in enough plaster so that it just shows free water over the plaster. Then stir thoroughly with a paddle or with the hands until the material is free of lumps and of a creamy consistency. Be sure that the pan in which the plaster is mixed is cleaned each time, as old plaster will make the new batch set too rapidly.

Plaster sets very rapidly so that frequent batches are made up instead of one large batch. But this quick hardening of plaster makes it possible to make the models and the molds very rapidly.

For more complicated models, modeling clay or wax is used. Often plaster and clay are combined where there is an ornament on a plain surface. Clay models are carved and shaped by various tools and with the hand. Naturally work of this kind is highly specialized and requires the work of experts.

When the model is completed it serves for making a mold either in sand, plaster or glue as the type of work calls for.

Fig. 1. This shows a template for a cornice molding. Notice that it bears against the edge of the bench.

Fig. 2. Running the plaster molding. Note that it is made hollow on a core of brick and similar material.

Fig. 3. The cornice completely run except for the extreme end.

Fig. 4. A semicircular template makes a sphere. The model is turned on a pipe.

MAKING THE MOLD

After the model is completed the mold is made. Plaster will be used where it can be made in a comparatively small number of pieces so that it can be both easily assembled and also allow of ready stripping.

Where the work would require a large number of pieces, if made of plaster, and has many undercuts, the mold is usually made of glue as described in the next section.

In making the plaster mold, the model is studied to see in how many pieces it will have to be made to allow for stripping. Each piece of the mold is made separately. The area of the model for one section of the mold is blocked off, usually by metal strips or strips of clay. Before starting to pour the mold, the model is shellacked and then greased to prevent the plaster of the mold from sticking to the model. Then this section of the model is covered with plaster, making it the full thickness required and reinforcing it, if need be, with coarse burlap or fibre mixed in the plaster. In the case of very large molds the back is reinforced with sticks of wood.

As soon as the plaster has hardened sufficiently the metal strips or clay used for blocking of that section of the model are removed and the joggle holes are cut in the edge. The edge is then shellacked and the next section poured against the first section of the mold to give a perfect fit. The plaster runs into the joggle holes and these serve to keep the sections of the mold in proper relative position.

Fig. 6. Applying the soft plaster while the mold is being turned.

After the sections of the mold are completed they are shellacked and greased and are then ready for casting.

Fig. 5. A template for a balustrade. The shaft is made of pipe and pipe fittings.

Fig. 7. The balustrade still on the shaft and a completed balustrade with square ends attached.

Glue Molds

If the piece is to be reproduced in a glue mold it must be shellacked thoroughly with orange shellac. The purpose of this is to keep the moisture in the clay from ruining the surface of the glue.

The next step in making a glue mold is to place a thin layer of clay over the entire model. The thickness of the clay should not exceed three quarters of an inch; this is later replaced with glue. The next step is to coat this with a thin layer of pure molding plaster of Paris of the best grade obtainable. This must be worked rapidly so that the plaster does not harden before this section of the mold is completed. The next step is to build up the section with fibre dipped in plaster of Paris. The fibre or burlap is used to reinforce the plaster. Should the mold crack the fibre will hold the pieces together. The plaster is mixed by partly filling a dish with water and then scattering a handful of plaster at a time over the entire surface of the water so it will absorb the water quickly and not form lumps. This should be continued until the plaster shows up at the surface of the water. It should then be stirred with the hand or a large spoon until it is of a creamy consistency.

Fig. 8 shows how shellac is applied to a clay model of a lion. Fig. 9 shows the building up of the partitions. In this particular case straps of sheet metal were used for this purpose. Fig. 10 shows the construction of one section of the plaster jacket. When this section of the plaster jacket sets up, the metal partition surrounding it is removed. The edges of the section are then trimmed off smooth, and joggle holes are cut into each edge. The edges are then shellacked and greased and the next section is built in the same manner. Fig. 11 illustrates the construction of the second section (which in this case is also the last section) of the mold for the lion.

The next step is to remove the plaster jackets from the model. When this is done the clay surrounding the model will usually adhere to the sections of the jacket. The surface of these plaster jackets is then scraped and trimmed as smooth as needed. They are then thoroughly shellacked and all the sections of the jacket and the model are greased. The grease commonly used is made of kerosene and stearine wax mixed in the proportion of four parts of kerosene to one part of wax. The jacket is then reassembled around the model and clamped with clamps of fibre and plaster ties across the joints. A funnel is then set over the top of the mold and held in place with a fibre and plaster tie. The mold is then poured full of hot glue. The glue is known as "casting glue" or "gelatine," and can be purchased of large packing companies, tanneries, and wholesale paint houses. The glue comes in flake form, and is prepared for use as follows:

The amount of glue required for the mold is placed in a tub or pail and covered with water. After about five minutes all the water is strained off as well as possible through a gunny sack or screening. The glue is then placed in a steam or hot water jacketed kettle until it melts. It is then ready for use and is poured into the mold, and allowed to cool and harden. The following day the clamps or plaster ties are removed and the jacket pried loose by driving an ordinary wood chisel into the joints of the mold. The glue jacket is then cut through to the model on the lines corresponding to the joints in the plaster jacket. The pieces of glue are then removed from the model and the model can be destroyed or set aside for further use.

Fig. 13 shows this glue and plaster jacket for the seated lion. The next step is to powder the surface of the glue with pulverized soapstone commonly known as French chalk. This is rubbed into the surface with a dusting brush. The purpose of this is to remove all grease from the surface of the glue. The glue is then thoroughly painted with a saturated solution of powdered alum and water. This is done to harden the surface of the glue. The glue is allowed to dry for two hours or so, and is then painted with a paint of the consistency of cream made up of litharge, linseed oil, turpentine and Japan drier, mixed in equal parts of each ingredient. This paint is then allowed to dry on the glue twelve hours, or over night, and will thoroughly waterproof the surface of the glue. Without this treatment only one or two good casts could be produced with a glue mold, whereas molds so treated can oftentimes be made to produce as many as ten or twelve casts. White lead paint and heavy varnishes are also used for this purpose.

The glue mold is then put back into the plaster jacket and then the mold is assembled complete and is ready to be filled with the concrete.

Fig. 8. Applying the shellac to the clay mold.

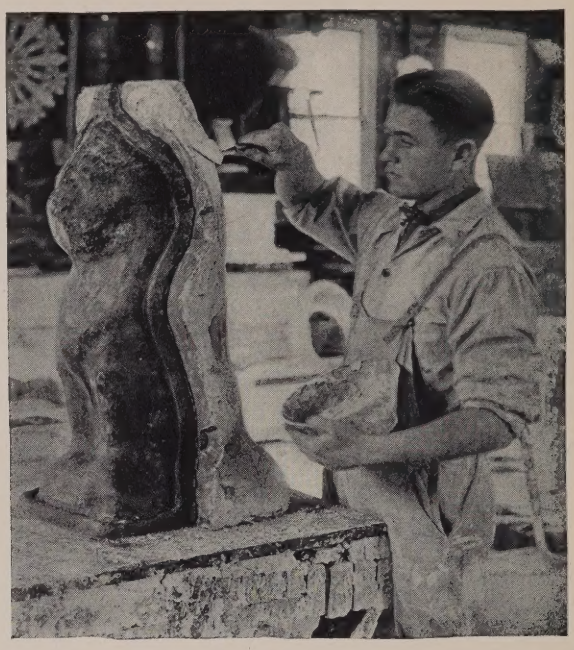


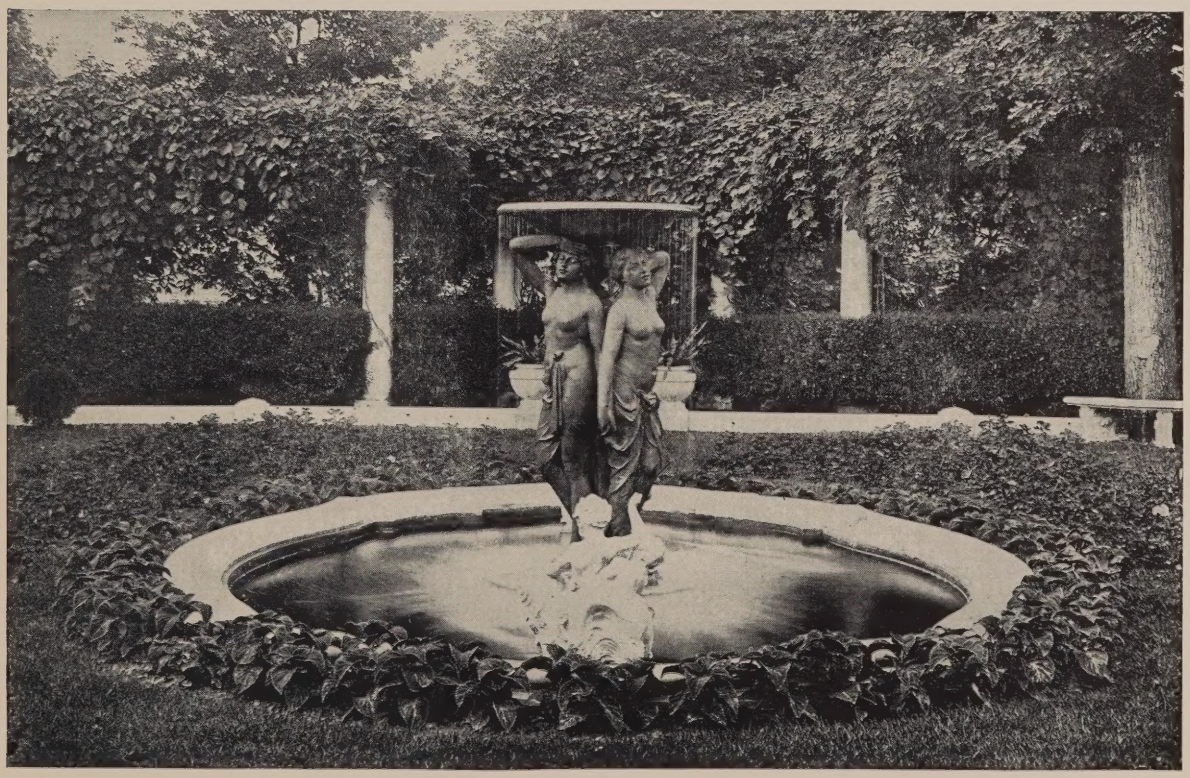
Fig. 10. Applying the plaster over the clay jacket.

Fig. 9. Putting in metal strips to divide the mold into two parts.

Fig. 11. Completing the plaster jacket which later holds the glue.

Fig. 12. The clay between the model and the outside plaster jacket has been removed and the space between is being filled with glue.

Fig. 13. The complete glue mold with the model in the center. On the right the glue mold has been partially removed from the plaster jacket.



Sand Molds

Sand molds are quite similar to the sand molds used in casting metal. They are used for the simpler and larger pieces of work such as for belt course pieces, sills, lintels and plain stone. As models for sand molds, either plaster or wood models are used. The plaster models have been described on page 6.

Wood models are prepared to the full size of the stone to be made. They are usually made hollow. The wood is well seasoned white pine or other soft wood and is thoroughly shellacked.

The wood mold shown in Fig. 14 is for casting a section of cornice stone. Due to the undercut of the molding of the stone, it is necessary to make the mold in pieces. This same idea is also used in making models for sand molds, so that the model can be removed from the sand mold. Plaster models are also made in sections in the same way. In each case the different parts are kept together with dowel pins.

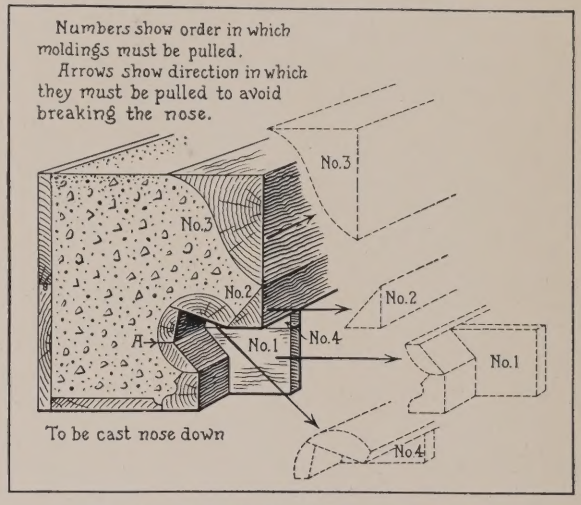
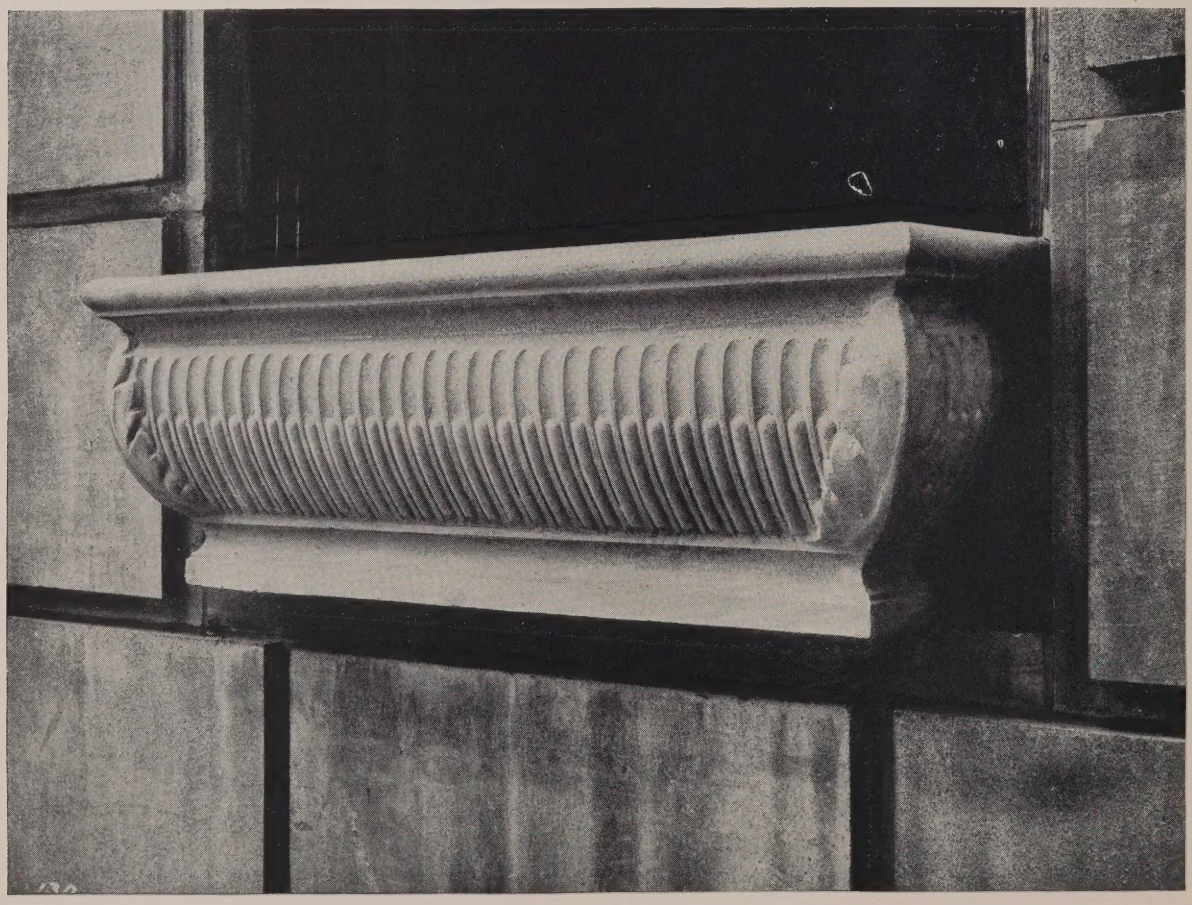
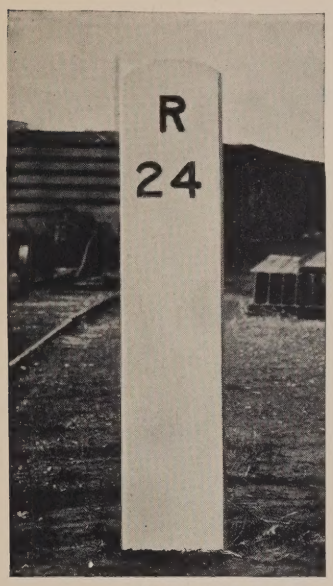
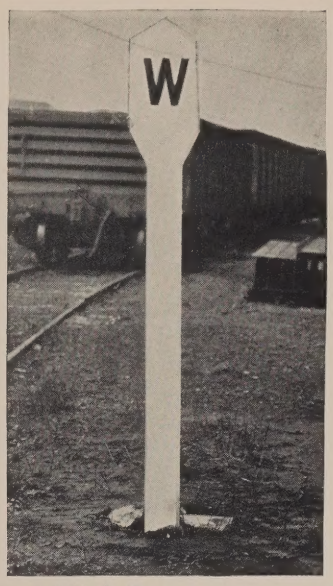


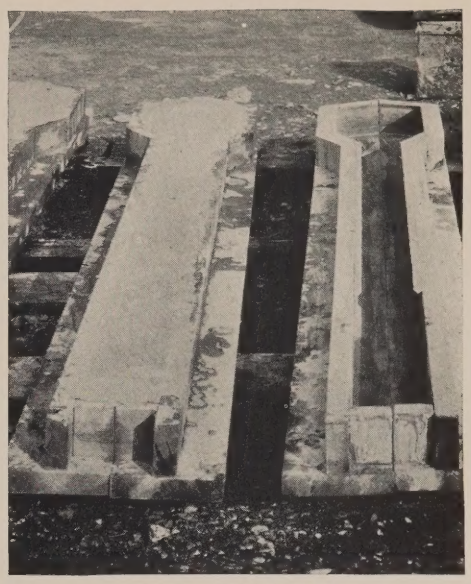
Fig. 14. Wood Mold with pieces that draw.



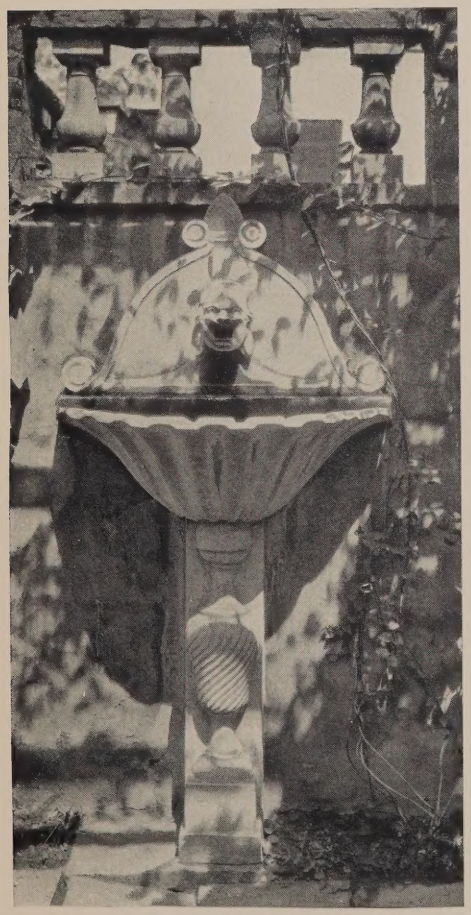




N. Y. C. R. R. Mile Post and Whistle Post.

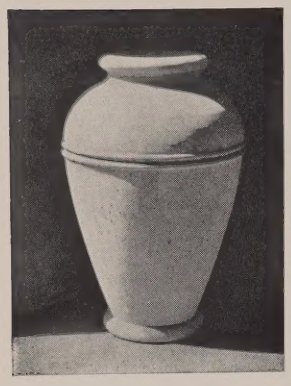


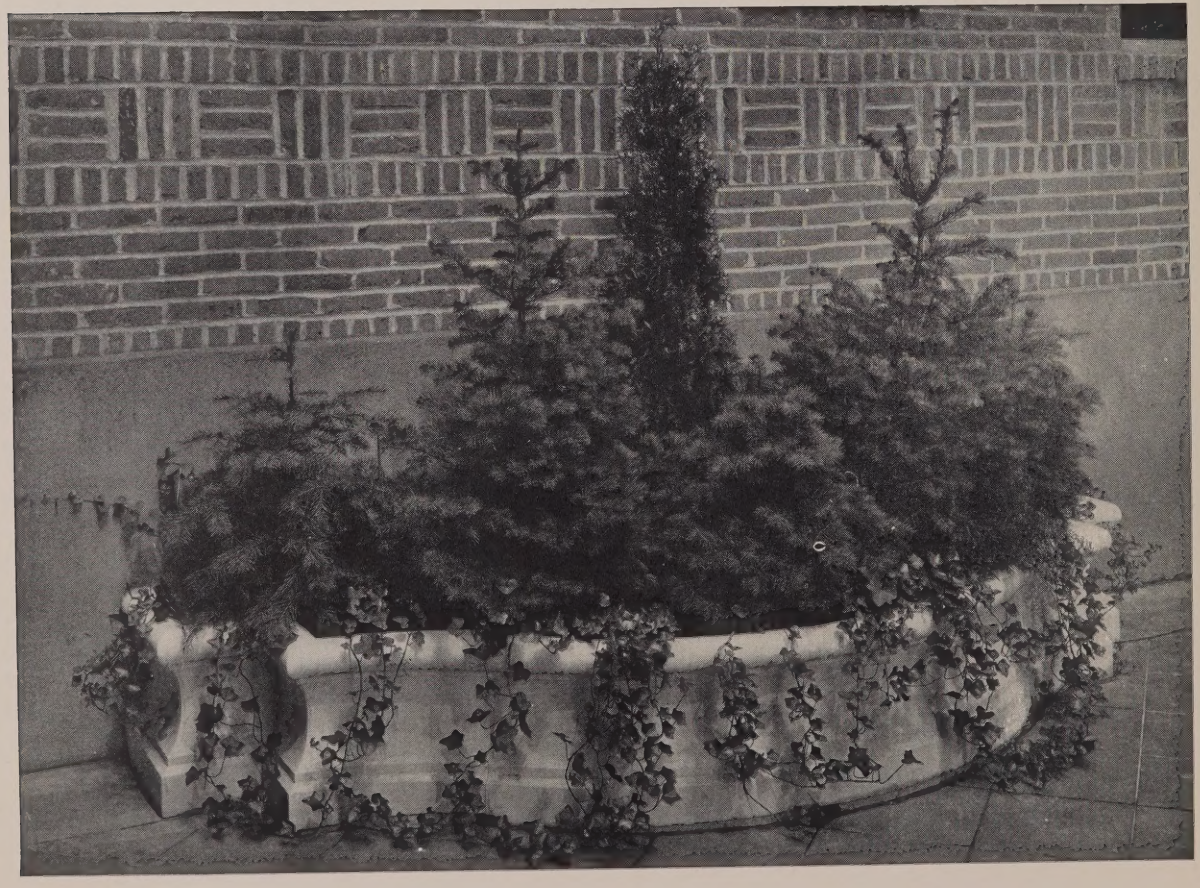
Mold for Whistle Post.



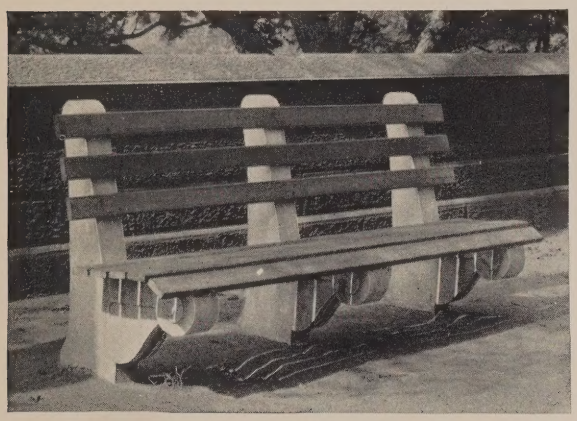
Ornamental Trim of Atlas White Portland Cement.

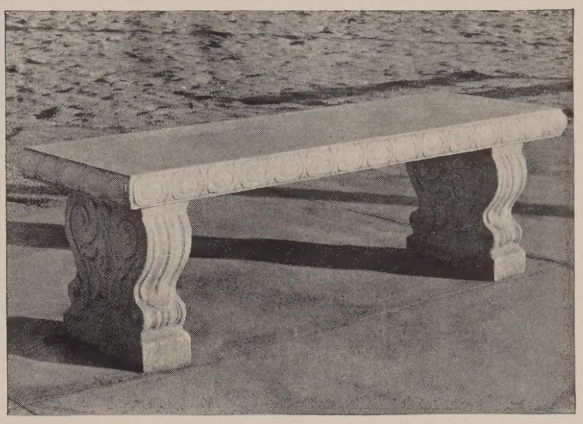
Typical Ornamental Work

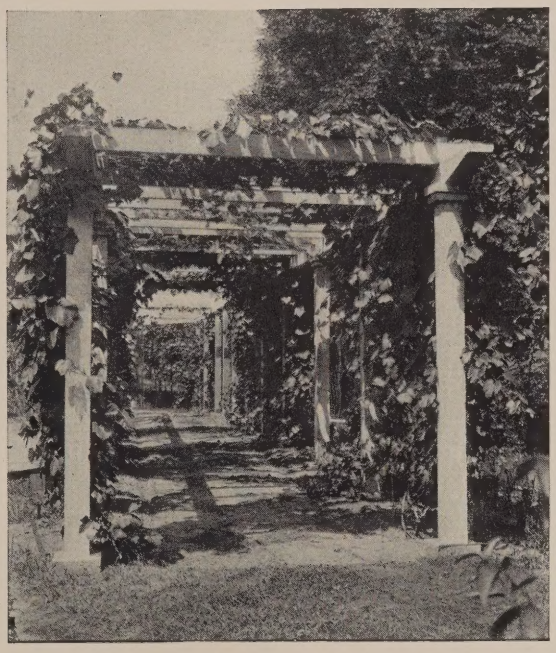


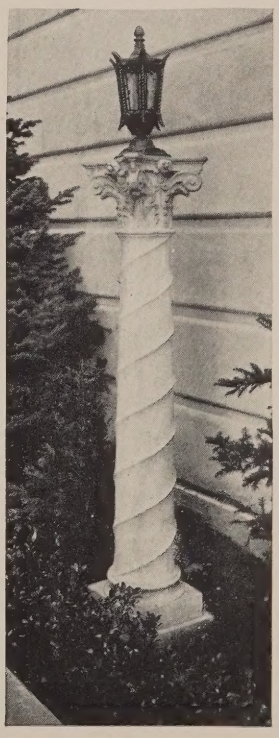


in Atlas White Portland Cement







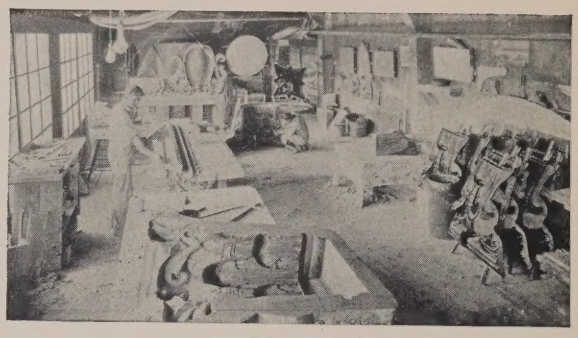


CAST CONCRETE STONE

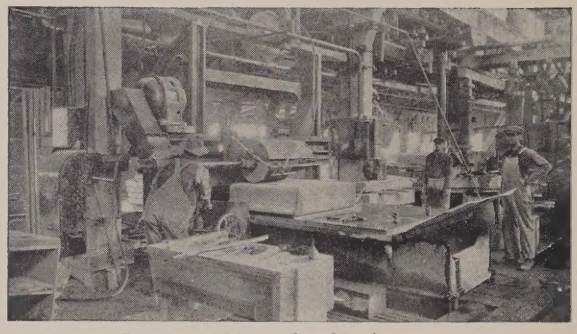
Cast concrete stone comprises the high grade cast stone used for the larger and more important buildings. Architectural stone of this character is in direct competition with natural stone such as limestone, marble and granite. Hence, a plant for the manufacture of this type of stone must be equipped to handle large orders and to turn out work with all types of ornamentation. In plants of this type, which are comparable to the large type cut stone plants, there must be men competent to model designs from architects' drawings, make all kinds of models and molds and after the stone has been cast there must be machinery of all types for its dressing and finishing.

In reality the operation of a cast concrete stone plant is much like that of a cut stone company except that instead of quarrying large blocks of stone and then reducing them by cutting to dimension and dressing or carving them as required, the stone is crushed, mixed with Portland cement and poured into molds of slightly larger size than the finished piece is to be. After curing it is then dressed down to the proper dimensions.

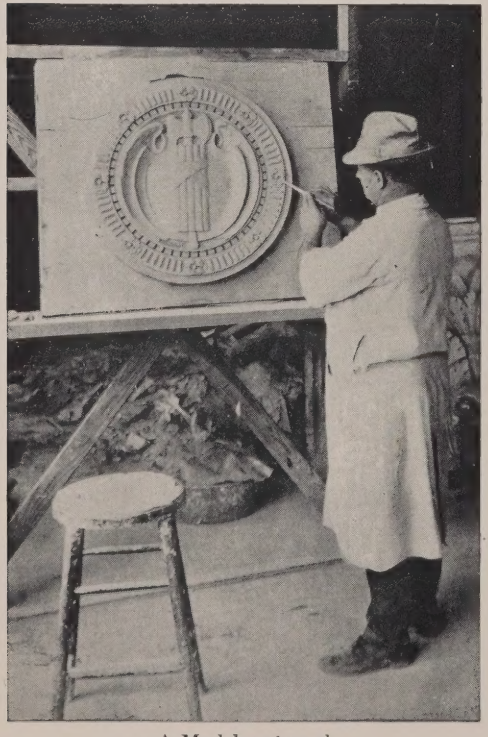
To handle work of this nature, large plants and experienced men are required.



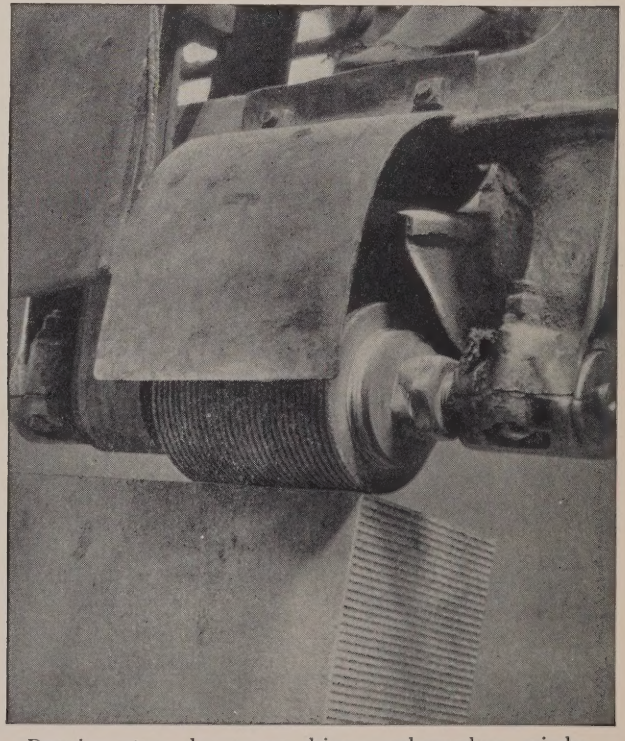
Modeling Room.



Power machinery for dressing stone.



A Modeler at work.



Dressing stone by power driven carborundum grinder.

Facing Concrete Block and Brick

The concrete block with an imitation rock face of a dead gray cement color always will have only a limited field of use. It may be structurally strong and satisfactory, but from the viewpoint of appearance it is unattractive.

Atlas White Portland Cement makes it possible for the manufacturers of concrete block and brick to give to their products a variety and beauty of finish that cannot be obtained with the regular gray Portland cement. A block or brick so finished has a far greater sales value because it is more attractive than the ordinary block. It will sell at a higher price and owners and architects will employ such products when they will not consider for exterior use a block or brick made with the usual gray cement finish.

The most satisfying finishes are those produced by using Atlas White Portland Cement for the surface. With a white sand or crushed white marble a pure white smooth surface may be obtained. By the use of colored crushed stone with the white cement an unlimited variety of color and texture can be secured. These colored stone chips are now marketed by many concerns just for this purpose. Color pigments are sometimes used with white cement, but the result is not so attractive as when color aggregate is employed. In general the lighter and more subdued color effects are to be preferred. These can be best obtained by using as surfacing material colored pebbles or crushed stone and white cement.

In general, machines cast block with the face either in the bottom of the mold or at one side. When the surfacing is to be in the bottom of the mold the facing is a very simple matter. The required amount of surfacing material which should be sufficient to form a layer about ½ to ¾ of an inch thick, is placed in the bottom of the mold. Care must be exercised to make certain that it is the same thickness throughout and well packed into the corners so that there will be no possibility for the backing material to show through. It is often best to bring the material slightly up on the sides so that if the block are laid with a raked joint the edges of the block will show the same color as the face.

In some machines the face is vertical. In such machines the facing is placed by using a dividing plate, thus allowing the facing mixture to be placed along the face to the required thickness. Then the backing material is placed, the division plate removed and the whole compacted to thoroughly bond the face and backing.

If the facing mixture is of white Portland cement and white sand, usually no further treatment is given. The mixture for such a facing should be not richer than one part of cement to two parts of sand, and may be made one of cement to three of sand.

Facing With Exposed Aggregates. Facing mixtures of crushed stone or small pebbles are usually made of one part white cement and two or three parts of aggregate. If there is no fine material in the aggregate, a small proportion of sand sometimes is necessary, but generally none is used.

Surfaces of this type must be treated to expose the aggregate by removing the film of cement on the surface of the particles and thus allow their true colors to show. Several methods of accomplishing this are in use. The most generally used and the simplest is to remove the film of cement by using a spray of water on the block as soon as possible after casting. Several variations of this method are in use. Some utilize a very fine spray under considerable pressure, immediately after the block is cast, with the face of the block horizontal. It is claimed that this allows more water to enter the block, so giving greater strength. In other cases the face is vertical, though this is sometimes objected to, as there is a tendency for the washed off cement to collect at the bottom of the face and streak, and for the water running down to make the bottom of the block too soggy.

Another method is to use a fine light spray and brush the aggregate gently with a camel's hair brush immediately after casting.

Some wait until the block has hardened several hours, and then wash the face with a stiff fibre brush, using a spray of water to carry away the scrubbed off material.

Still another method is to wash the face of the block with a solution of four parts of water to one part commercial muriatic acid after the block has hardened. Care must be taken to see that all excess acid is removed by washing with plenty of clean water.

Mixing, Casting and Curing

There are two general processes used—the dry process and the wet process.

The dry process has the advantage of allowing quick removal of the molds, but does not give as strong and dense concrete as the poured process. Naturally, it is cheaper than the wet process.

In the dry process only sufficient water is added to moisten the mixture so that it "balls" in the hand when squeezed. Such a mixture can be tamped in the molds and will hold its shape when the mold is removed before the cement has started to set and give strength to the mixture.

This process is used mostly for faced work; that is, where only the exterior is of the white Portland cement and special aggregate and ordinary gray Portland cement and sand are used for the backing, a process that would be practically impossible with the wet poured work.

WET POURED CASTING

In this work the mixture is mixed wet like ordinary concrete and poured into the molds. More care in mixing and pouring is required than in ordinary concrete work.

The mixture should contain the minimum amount of water and still have sufficient plasticity so that all the corners of the mold will be filled. After the mold is filled the concrete should be thoroughly puddled and tamped and vibrated by tapping with a hammer.

The concrete should be mixed in a batch mixer for at least five minutes. It will be found that this longer time makes a more plastic mix with less water. The less water used, the stronger will be the concrete and less likely to craze.

MIXTURES

Sand and Portland cement are sometimes used but more often crushed stone is employed instead of sand. This is done because the color of the stone is more attractive than the sand. The stone is usually crushed marble, either white or colored, or crushed granites of various color although any crushed stone of the proper strength and quality and of the right color can be used.

These materials are being produced in various parts of the country and the names of manufacturers will be furnished upon request.

The beauty of ornamental concrete work lies in its color and this is made possible by the aggregates used in the work.

The size of the aggregate will depend upon the size of the work and will usually range from a maximum of material through a No. 8 screen to material of ¼ or even ½″ size. Fine dust should be removed and under no condition should stone dust be mixed with Portland cement as it will lead to unsatisfactory results.

The material should be well graded with coarse material predominating.

SURFACE TREATMENT

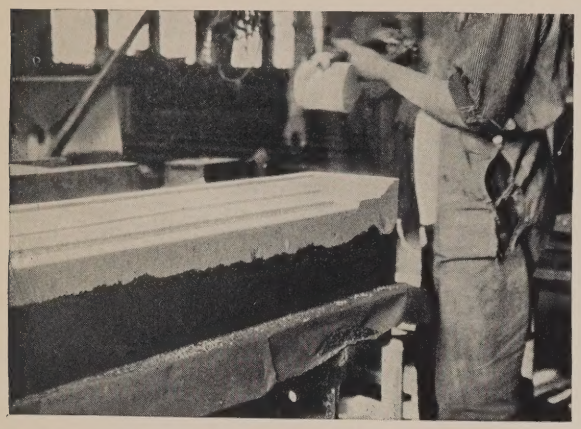
After the cast is made it is necessary to treat the surface by removing the film of cement, both to bring out the color of the aggregate and to minimize crazing.

There are several methods of doing this. If the work is of such a nature as to allow it, and it can be done immediately, the surface is washed with water by means of a brush. Great care must be taken not to make the cast soggy and this method can only be used while the mix is still soft as in dry tamped work. The more customary method is to wash the cast with muriatic acid in the proportions of about one part water to 5 parts of acid. This is either applied with a brush or in some cases the entire cast is dipped into an acid bath. As soon as the cement is removed the cast should be thoroughly washed to remove all trace of the acid.

In some work the entire surface is removed by dressing in the same manner as natural stone. Where this is to be done the model is made oversize to allow for the material removal. This work is done by power machines, or by hand tooling and is extremely effective, making the material look much more like natural stone.

CURING

The strength of any concrete depends largely upon its curing and much care should be given to this point. Portland cement sets up by combining chemically with water, and unless it has sufficient



Removing Film by Power Spray.

Removing Film by Scrubbing.

water during the hardening period the concrete will not get its full strength. Curing, then, consists of seeing that the concrete has this water. Enough was put in when the concrete was poured. It is necessary so to protect the concrete that this water does not evaporate before the cement uses it. The best method of curing then is to immerse the cast in water for several weeks.

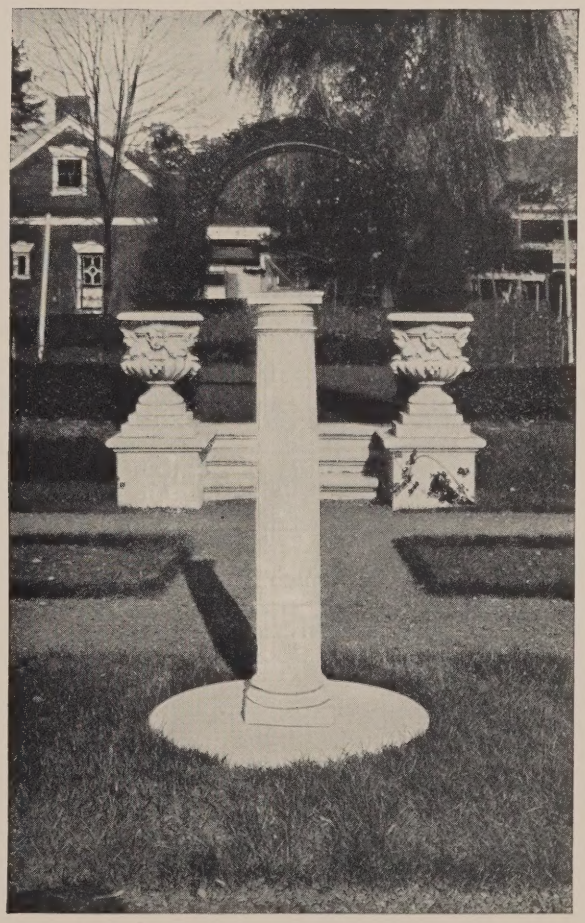
This is not always possible. Other methods are to keep the concrete wet or moist to prevent evaporation. Where the amount of work justifies it the best method is a moist room kept so by a fog spray. In cold weather live steam can be used which will both keep the work warm and thus hasten the set and also keep the work moist.

Other ways are to cover the work with wet cloths or bury them in damp sand.

HASTENING THE SET

It is a natural desire to release the molds for further casts without delay, and for this reason it is necessary to have the concrete harden as soon as possible. The only safe way to accomplish this is by means of heat (care must be used in case of glue molds or the glue will melt). This means warming the aggregate and the mold but not above 100 degrees F.

We cannot recommend the use of chemical accelerators at present, as we do not know definitely what their action is after a period of several years. We do warn particularly against the addition of gypsum or plaster as they will invariably cause disintegration of the concrete.



Information on the use of Portland cement will be gladly furnished you by The Atlas Technical Department, which consists of a staff of trained Engineers and is maintained for the purpose of cooperating with users of cement.

You are under no obligation for this service. The Company furnishes this book and the information and assistance referred to above, without guaranty, warrant or other obligation on its part.

THE ATLAS PORTLAND CEMENT COMPANY.

ATLAS WHITE PORTLAND CEMENT

"Pure WHITE and with all the strength of gray Portland cement."

We are manufacturers of Portland cement of two colors, gray and white. Both of these conform in every way with the Standard Specifications for Portland Cement of the American Society for Testing Materials and adopted by the U. S. Government, the American Institute of Architects, American Society of Civil Engineers and similar bodies.

Because of the pure white color of white Atlas Portland Cement it is used wherever the gray Atlas Portland cement does not give the desired color effect.

Atlas White Portland Cement can be used for any work for which gray Portland cement is suitable, because it gives equal strength, equal wear and equal durability.

The use of white Atlas Portland Cement results in a mortar which will not stain fine textured stone such as Indiana Limestone, marble and similar stones which might be stained by mortar made with gray Portland cement.

Among the established uses of Atlas White Portland Cement are:—

For its color

Stucco—Makes possible a great variety of shades and tints because of neutrality of color. It is colored by mixing directly with a sand of the proper color or by pigments.

Brick, Terra Cotta or Tile Joints—Gives either a pure white mortar to contrast with the color of the material or a tinted joint to blend with the tonal value of the brick or terra cotta. It is colored by mixing directly with a sand of the proper color or by pigments.

Cast Stone, Trim and Garden Furniture—Gives white or colored effects where gray cement color would be dead and uninteresting.

Terrazzo—Makes possible an entirely new and attractive range of color effects. Will not soil and has the same wearing qualities as gray Portland Cement.

Swimming Pools—Used either with white sand or sometimes tinted as a plaster for lining swimming pools. Also used to pour the exterior walls to give a white effect directly.

Interior Plastering—For interior plastering it gives all the range of colors and with textured walls, the strength necessary to give good wearing quality.

It is unaffected by moisture and therefore also used for dairies, cold storage rooms and laboratories.

For its non-staining qualities

Pointing, Setting and Backing Limestone. Widely used for setting Indiana Limestone, marble and similar stone. Gives the strongest possible non-staining mortar.

Strength, Physical and Chemical Properties of Atlas White Portland Cement in comparison with the Standard Specifications for Portland Cement (which include White).

1 Part Cement and 3 Parts Sand, Tensile Strength per Square Inch.	Standard Specifications	Atlas White Portland Cement.
At 7 days	200 Lbs.	331 Lbs.
Ditto at 28 days	300 Lbs.	467 Lbs.
Loss on Ignition	Not to exceed 4.00%	2.13%
Sulphuric Anhydride	" " " 2.00%	1.83%
Magnesia	" " " 5.00%	1.19%
Fineness—Residue on No. 200 sieve	" " " 22.00%	6.9%
Initial set	Not less than 45 to 60 minutes	2 hr. 30 min.
Final set	Within 10 hours	5 hr. 00 min.

THE ATLAS PORTLAND CEMENT COMPANY

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